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REVIEW OF THE MALARIA PROGRAMME IN THE AFRICAN REGION *

by

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1. INTRODUCTION

During the past year there has been a steady progress in the malaria field. Many new projects have been implemented, and there has been an increase in staffing and financial support from WHO to the older established schemes. Lack of funds, both from Government and the Organization sources, have prevented the extension of existing projects, although in many cases it is likely that the desired effect of interruption of transmission of malaria can only be achieved by an increase in the project area. In the smaller projects in African conditions the effect of movement of population through the project area is often so great as to prejudice the entire success of the scheme.

There has been a gradual transition from the aim of malaria control to that of eradication. This means that only the interruption of transmission of the disease can be accepted as evidence of success, indeed a difficult criterion to realize, because eradication demands a far greater perfection in all aspects of the project than control. In many cases the results have been disappointing for a variety of reasons which are discussed in more detail below.

There have also been long delays in implementation of new projects, which have been frustrating to governments and project staff alike. Before a project can be put into operation, and funds released for recruitment of personnel and despatch of

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supplies and equipment, a very detailed plan of operations must be prepared on which the whole future conduct of the campaign is based. Before such a plan is accepted by the Government and the international agencies, considerable revision is required to meet the respective requirements of both parties, and this takes often a very long time to complete. Even when the plan is signed there is still a further delay due to the difficulties in recruitment of suitable personnel and also to allow for the shipment and delivery of transport and supplies. However, every attempt is being made to streamline these defects in order that projects can in future be implemented more rapidly after their initial planning.

With the transition from control to eradication increasing stress is laid on improvement of the administrative aspect. In view of the degree of perfection demanded if transmission is to be interrupted, every aspect of the administrative side of the project requires to be developed and properly staffed in order that the technical personnel may devote themselves wholly to the vital task of evaluation. In many cases it has been found necessary to include international administrative officers on the staff of the projects. At the same time, largely due to inefficient reporting in the past, very little is known about the accurate costing of malaria eradication projects in the African Region. The cost per head of population during the attack phase varies greatly according to the difficulty of working in local conditions, with the figures ranging from $US.0.15 per head of population in Swaziland to $1.20 in the forest area of the plateau of Liberia. More efficient administration and logistics in the field combined with a better system of standardized reporting will ensure the provision of the costing data necessary for planning a large-scale eradication project.

This review covers some of the more important aspects of malaria eradication in the African Region with emphasis on the various factors which have led to failure in the past, and outlines the steps which should be taken in future to ensure a higher degree of efficiency in all the projects.

2. PREPARATION FOR A MALARIA ERADICATION PROJECT

Emphasis in the past has always been on a careful malariometric study of the situation in the country before beginning the attack phase of the project. In most cases this survey has been in the form of a "pilot project", whose aims were to demonstrate the degree of malaria infection in the community, the bionomics of the principal vectors and the efficiency and duration of effect of different insecticides in local conditions. This material is of vital importance both to permit the realistic planning of the malaria eradication programme and also to provide adequate baseline data for later evaluation of the progress of the project. However, in very few projects has the necessary time been spent on a complete geographical reconnaissance throughout the proposed project area. Such a reconnaissance involves the preparation of maps showing means of access to villages and hamlets, and also

includes a complete house and population survey. On these data the whole operation of the spraying campaign is based, and without them the later evaluation cannot be accurately planned and carried out.

It is easy to see how, in areas where communications are difficult or absent, the lack of geographical reconnaissance has resulted in the missing of a significant number of houses in the spraying campaign. Total coverage, which is the aim of the spraying operations, can only be achieved if the area is properly mapped and the location of every house known which enables the programme of work of the spray gangs to be efficiently planned. Many malaria projects in this region have based their original calculations on a rough guess of the houses and populations involved. It is hardly surprising therefore that their results do not show the interruption of transmission. It is considered to be well worth the delay for all work in established projects to cease for a period of six months to enable this geographical reconnaissance to be carried out under the supervision of a sanitarian or field officer. The greater efficiency and better planning of work which will result from these measures may change a partial failure into a complete success as measured in terms of the interruption of transmission of malaria.

It is emphasized that the geographical reconnaissance must be a continuing feature of any project. New houses are built, old ones destroyed, and new villages spring up. All these changes must be continually registered on the project maps, to ensure that total coverage is maintained in the succeeding years of the campaign.

Another important item which must be considered during the preparatory phase of an eradication project is the introduction of legislation. In many territories local enactments permit the entry of health personnel to houses for the purpose of spraying and for searching for the presence of vectors. However, in the vast majority of countries in this region there are no means of enforcing spraying in the case of refusal by the householder. Although it is rarely necessary to apply such legislation, its mere existence acts as a deterrent to the householder who is considering refusing admission to the spraymen. A refusal of this type in a village is infectious and if successful is often followed by many more, especially in and around townships. Such legislation is frequently difficult to introduce as it affects the rights of the individual. However, it should be remembered that the government as well as the Organization is spending a considerable amount of money to achieve the eradication of malaria. Only when this aim is realized will it be possible for the annual outlay to be significantly reduced. It is therefore in the government's interest to prevent the occurrence of these refusals, the effect of which on total coverage may in many cases be significant enough to prejudice the entire success of the campaign.

Some of the need for legislation can be offset by a well prepared health education campaign throughout the whole of the project area. This requires careful planning and a detailed study of local conditions. The work of the spraying and evaluation staff can be made easier by a preparatory spread of information among the population, because much of the local opposition is due to lack of understanding. Health education in an eradication project does not demand a great deal of expensive equipment and demonstration facilities. It depends in most cases upon a good understanding of local feeling and local custom and on a careful study of the impact of the needs of eradication on the local population. When this impact is fully understood, a programme of public education can be put into effect as an essential part of the preparatory phase of the project, and continued and developed throughout the whole of the eradication campaign in order to keep the population aware of progress.

3. RESIDUAL SPRAYING

In practically all types of local conditions the main weapon for eradication at the disposal of the malariologist is residual spraying. Even with the development of resistance in anophelines to insecticides and in the presence of such unfavourable factors as exophily in the mosquito, residual spraying still remains the most effective means of interrupting transmission of malaria. However, only total coverage can be expected to achieve this objective. This coverage relates not only to the spraying of every habitation within the project area, but also to the efficient treatment of every part of each habitation which may act as a resting place to the anopheline vectors. In much of Africa there is evidence to show that A.gambiae rests high up in the roof as well as under the eaves outside the house. In many parts of the continent (e.g. Liberia and Zanzibar) the roofs are exceedingly high, extending up to twenty feet from floor level. Even when there is no intervening ceiling such a roof is difficult for the spraymen to treat with conventional apparatus, and the widespread problem of partial ceilings accentuates this difficulty. It is a matter of firm policy that all possible resting surfaces should be treated as part of the routine spraying, unless there is definite evidence to show that the vectors do not rest there either before or after the application of residual insecticides

In order to ensure this total coverage a very high degree of effective supervision is necessary. In general the spraymen and their immediate supervisors (squad leaders) carry out their work in an efficient manner. If there is failure to achieve total coverage it is not as a rule the fault of this level of employee. In the African region, however, there is a serious lack of the middle grade of supervisor. For this reason, it has been necessary to provide for an increase in international sanitarians (or field officers) in all the projects in the region. This increase is clearly shown by a comparison of the number of sanitarians provided by WHO in 1958 (6) and in 1959 (8), whereas in 1960, thirty sanitarians are foreseen.

One should not, however, accept the presence of these international staff as the solution to the problem. Every attempt is being made to establish training courses both in the English and French language where a large number of national supervisors can receive expert instruction. Other methods of checking on the efficiency of spraying (chemical estimation, bio-assay, etc.) cannot in any way replace the vital field supervision which is the only means of ensuring total coverage.

During the past two years, a great deal of evidence has been collected of the development of resistance in A.gambiae to the dieldrin/BHC group. It is interesting to note that this resistance has only been described so far in West Africa. In East and South Africa, in spite of the extensive use of dieldrin and BHC for many years, there has been no evidence of resistance and A.gambiae remains normally susceptible to dieldrin. However, due to the many disadvantages of this insecticide, which include its toxicity to man and animals, its intrinsic expense and its failure to live up to the original claim of one year duration of residual effect in African conditions, dieldrin is fast giving place to DDT. The latter insecticide, in spite of its many theoretical disadvantages (e.g. irritant effect, lower initial toxicity to anophelines), continues to give excellent results when properly applied. In Liberia, where the conditions for residual spraying are extremely difficult, the concentration on total coverage and on efficient treatment has resulted in the apparent interruption of transmission over a wide area, It is, however, too early as yet to be able to assess this project, but it can be said that the thorough application of DDT alone in the absence of any associated chemoprophylaxis, has produced the most encouraging results. So far there is no proven case of developed resistance of A.gambiae to DDT although there has been a suggestion of a resistant A.melas on the coast of the Belgian Congo which could not be finally established due to the disappearance of the species following intensive aerial larviciding. Naturally, continual watch is being kept in every project for the development of any new resistance so that the necessary steps can be taken to remedy the situation without delay.

4. EVALUATION

Evaluation of a malaria eradication project does not only entail the collection of epidemiological and entomological data. It must cover every aspect of the project in order to show up points of failure in the conduct of the programme. Like the geographical reconnaissance it is a continuing commitment. In all phases of eradication the aim of evaluation should be to demonstrate failure in any part of the work. This will include the missing of houses in the spraying campaign, incomplete coverage in any auxiliary drug prophylaxis, the presence of small pockets of malaria infection in a community and especially the production of secondary cases resulting either from local or immigrant parasite carriers. But evaluation must go further. It should not only point out these various failures but must also demonstrate the cause and provide the remedy.

As judged by these criteria, which are only given in a general sense and do not by any means cover the whole field, the standard of evaluation in most of the projects in the region is disappointingly low. Much of this is due to lack of sufficiently trained staff. More trained technicians are urgently required and to provide them will be one of the aims of the Malaria Eradication Training Centres shortly to be set up by WHO in the region. In addition, poor administration has also been responsible for failure to evaluate accurately the progress of projects.

In order that the many programmes now in progress within the region can be properly studied and evaluated, a great deal of data must be made available relating to all aspects of the work. As a result of such a study details can be made available not only of the progress of the projects but also of the costing of the different phases of the eradication programme. This calls for a standardization of reporting in order that the necessary data can be extracted without too much difficulty. The system of reporting from many projects in the past has been very variable, and frequently vital data are omitted which cannot at a later date be obtained. WHO is at present preparing a standardized system of reporting. It is emphasized that such a report will not only make it easier to extract the necessary data but will also simplify the task of the project leader.

5. THE USE OF DRUGS IN MALARIA PROGRAMMES IN THE AFRICAN REGION

Drugs are indicated in four different ways in the malaria eradication programme in Africa:

1) In the form of mass chemoprophylaxis as an auxiliary to residual spraying, in areas where the latter method is unable by itself to achieve the interruption of transmission for some technical reason (exophily, etc.)

2) For the single dose treatment of immigrants or of nomadic populations (e.g. Fulani) who are entering or traversing project areas. Single dose treatment only is usually possible in these cases because of the difficulty in following up the immigrants.

3) For the treatment of parasite-positive cases in the surveillance and maintenance phases of a malaria eradication programme.

4) In the form of medicated salt as a sole means of eradicating malaria in an area where other methods are not practicable for various reasons.

Mass chemoprophylaxis as an auxiliary to residual spraying has been tried out in a number of territories within the region. In order to keep the cost of this auxiliary method to a minimum, every attempt has been made to find the means whereby the drugs can be administered under local arrangements (by village headmen, schoolmasters, etc.) in order to avoid the expense and administrative difficulties of treatment by health teams on a nominal roll basis. The results have been on the whole disappointing largely due to the fact that a total coverage of the population with the drug has not been achieved. In those areas where 100% treatment of the inhabitants has been obtained the results have been universally excellent. Such conditions cannot often be obtained, and it would appear therefore that mass chemoprophylaxis should only be reserved for areas where it has been conclusively shown that residual spraying with total coverage cannot interrupt transmission by itself. It is not considered that this conclusive evidence has been demonstrated in any project in the region.

The single dose treatment for immigrant and nomadic populations is at present the subject of study in many parts of Africa. Such drugs as primaquine and pyrimethamine, in conjunction with chloroquine as a schizonticide, are being tried out in many areas and it is hoped that a comparative study will be able to be made within the next few months. The treatment of cases in the surveillance phase of eradication programmes is a problem which has presented very little opportunity for study in this region. With the introduction, however, of new surveillance projects at the end of this year and during 1960 more information will become available. In any event, the treatment of cases of malaria has been exhaustively studied elsewhere in the world, and should provide little difficulty in practice.

Pinotti's method of the eradication of malaria by the use of medicated salt will shortly be put on trial in Northern Ghana in an area with a population of 60,000. The programme is in the preparatory phase at present and it is not anticipated that the supply of medicated salt will be distributed before mid-1960. This method, if shown to be practicable in African conditions, may be indicated in certain areas where residual spraying is difficult if not impossible to carry out with the degree of perfection demanded for eradication of malaria. There is, for example, reason to believe that all the salt sources for the central forest areas of Liberia are restricted to limited lines of supply. If this can be shown to be the case, and a study is now in progress, it may be possible to deal with large areas by this method alone - areas in which residual spraying presents unusual difficulties due to the abnormally difficult terrain.

6. TRAINING

Although there are still many technical difficulties to be solved in different parts of the region, the principal barriers to malaria eradication in Africa are a lack of funds and a lack of trained personnel. Little can be done about the lack of funds at this stage, but a great deal can be done to improve the numbers and the standard of trained personnel in the region. It is planned to establish at Amani in Tanganyika a Malaria Eradication Training Centre which will be staffed and run by WHO. This training centre, which is planned to begin its courses of instruction during the second half of 1960, will provide for trainees at all levels from the English-speaking countries in the region. Three or four courses will be run each year, each one providing instruction for twelve to fifteen trainees. In addition to these full courses there will be short refresher courses specially intended for more senior personnel. In view of the serious need for field supervisors and laboratory technicians (both entomological and haematological), who play a vital part in the field campaigns and in the evaluation respectively, emphasis will be placed during the early courses on this level of personnel. For the more senior staff, WHO will endeavour to provide the opportunity for them to visit projects elsewhere as well as to take part in the refresher courses at the training centre. The specific needs of malaria eradication programmes will be stressed in all forms of training. It is hoped to establish a second training centre, this time for courses in the French language, during the second half of 1960 with the aim of beginning instruction early in 1961. Training in all its aspects represents an urgent need in this region and it will receive high priority in the WHO programme during the next few years.

7. RESEARCH

There are still a large number of important questions with a direct bearing on the conduct of the malaria eradication programme which can only be answered by applied research, either by field teams or in institutes within the region. The following items give an indication of the scope of this important work in which WHO will endeavour to provide assistance during the next two years:

1) The importance of the symptomless parasite carrier is one which will become of increasing significance as the surveillance phase of malaria eradication programmes in the African region is reached. Very little is known of the part played by the symptomless carrier in transmission and in the production of secondary cases. Swaziland would provide an ideal centre for such a study. If fever cannot be accepted as a criterion in case detection in tropical Africa, the difficulties of surveillance will be greatly increased.

2) An effective and long-lasting single-dose treatment must be developed for immigrants entering a protected area. This field and laboratory study will require the combined efforts of the malariologist and entomologist.

3) More study is required on the transmission of L. falciparum in Africa. There are indications that the African strain of this parasite may be more persistent than that from other parts of the world. This, if true, would have an important bearing on the conduct of the later stages of eradication programmes, and also affect the evaluation of their results.

4) A great deal more study is required on A. gambiae, the variety of behaviour in which in different parts of the region suggests the presence of a complex similar to the A. funestus group, rather than a single species.

5) Although A. gambiae has not yet been reported as resistant to DDT, there has always been this grim possibility to bear in mind. Experiments should therefore be carried out on an increasing scale with other insecticides (e.g. the organo-phosphorus group) so that the development of double resistance to DDT and to the dieldrin group would not result in complete failure of the programmes.

These are examples of some of the basic needs in the applied research programme. It is considered that WHO should play an important part in helping to find a solution to these many pressing problems. There are now many Institutes and field teams in the region which, with a little assistance in terms of equipment and supplies, could carry out such a research programme. The apportioning of this work and the amount and type of assistance required from the Organization will form the subject of discussion at the 1959 Malaria Technical Meeting at Brazzaville.

8. THE FUTURE OF MALARIA ERADICATION IN THE AFRICAN REGION

The principal question which still remains to be answered in much of the African region is whether transmission of malaria can be interrupted by residual spraying with DDT as a sole measure. It is essential that the organo-phosphorus group of insecticides should also be tried out in the field to provide a possible alternative to DDT. There are indications that, even where conditions of transmission and communication are most difficult as in the central province of Liberia, efficiently conducted total coverage with DDT may be able to interrupt transmission of the disease.

In several projects where spraying has been well executed, there are other factors which have been partly responsible for the failure to interrupt transmission. For example, the nomadic Fulani tribesmen in N. Nigeria are continually on the move throughout the malaria project area, and probably provide the main source of reinfection and persistence of transmission. The projects in Bobo Dioulasso and in Taveta Paré are both too small for population movement to be excluded as a factor in maintaining transmission, although vector exophily in the former project is also probably an important factor. In the majority of projects within the region, however, total coverage with insecticides has not been achieved.

For these reasons it is not possible to state that residual insecticide as a sole measure has failed to interrupt transmission. There is no doubt that anopheline and human exophily may be responsible for failure of residual spraying in certain areas, as already demonstrated in Bobo Dioulasso. How widespread this factor is, and how important it would be in widely extended project areas in which emphasis was placed on total coverage with insecticide, yet remains to be seen. The only available alternative to residual spraying is mass chemoprophylaxis, whether alone or in association with spraying. This method has been shown to be very difficult in execution, and wholly unsatisfactory unless carefully controlled on a nominal roll basis. It is therefore evident that far more attention must be paid during the next few years to the perfection of residual spraying in all projects with the aim of ensuring total coverage.

The future policy of WHO in the African region can therefore be briefly summarized as follows:

1. To promote and assist eradication of malaria wherever it is both technically and economically feasible. An example is the South-East African malaria eradication project which is beginning this year and which should pass from the assessment into the attack phase in the second half of 1960.

2. To assist in the planning and execution, subject to the availability of funds, of malaria eradication pilot projects in countries where eradication is not immediately feasible either on technical or financial grounds. These pilot projects must be time-limited with normally a maximum of three years, and their objective is clear: to interrupt transmission of malaria in local conditions. As a result of each such project, a detailed technical and administrative plan will be prepared for eradication of malaria in all or part of the country concerned according to the availability of financial resources. A clear indication of the cost of such a campaign over a number of years will also be made available both to the Government and to WHO as a result of the pilot project. Increasing numbers of these malaria eradication pilot projects are planned to begin during the next two years.

3. To provide within the region training facilities in the French and English language for all grades of personnel, with special emphasis on the field supervisor and the technician. As far as possible, facilities will also be provided for travel of the senior grades of professional staff to visit projects elsewhere and, where indicated, to attend refresher courses at the training centres.

4. To promote and assist applied research, both in Institutes and in projects in order to find the solution to many of the pressing problems which still exist in the malaria field. The solution of these problems will help not only by improving the efficiency of malaria programmes in the region but also by reducing their cost and duration.

5. To provide technical and administrative advice to Governments and projects within the region. Where a long-term survey is indicated, this will be carried out by engaging consultants to visit the countries concerned or by sending there the Regional Office Assessment Team. The Regional Office staff of advisers is being strengthened by the addition of a second malariologist, an entomologist, an engineer, an administrator and a health educator. These advisers will be available to visit Governments or projects on request.

6. To circulate information of progress and new developments among all the teams working in the region. An internal magazine is being started at the Regional Office which it is hoped will provide up-to-date information together with details of interesting work carried out by members of WHO and Government staff associated with the malaria projects. The costing of all aspects of each project will be calculated and made available. At the same time the Malaria Year Book, published for the first time this year, will be re-issued each year in revised form with up-to-date information on each project. Conferences and Technical Meetings will continue to be held for exchange of information, to provide an opportunity for discussion of important problems and for the formulation of new policies within the region.

This is a herculean task but it must be remembered that malaria eradication is itself a dynamic conception, and must be an expanding programme if it is to be successful. To promote and assist in the eradication of malaria on a global scale is the expressed policy of WHO, and Africa presents the greatest challenge. If, at a later stage, funds are made available to enable this region to proceed to inter-country eradication, the persistence of unsolved technical and administrative difficulties and the absence of well-trained national personnel will present an effective barrier to success. These then are the obstacles to progress which the governments and WHO must work together to overcome during the next few years.